Comparative Analysis of Technologies Used on *Fortune 500* and *Inc. 500* Corporate Web Sites

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This comparative study examined the Internet and Web technologies used on the Fortune 500 and Inc. 500 corporate Web sites. Data were collected from two randomly selected sample groups: 216 Fortune 500 corporate sites and 206 Inc. 500 corporate sites. The findings indicated that both the Fortune 500 and Inc. 500 corporate Web sites used html, JavaScript, css, asp, VBScript, gif pictures, jpg pictures, and email more frequently than other technologies for their home pages, public and investor relations, information search, B2C, B2B, career, and contact-us sites. Xml and aspx were identified on just a few sites. Both groups demonstrated the efficient and effective use of their selected Web programming technologies, graphics, and multimedia. The significant differences between the two groups indicate that the Fortune 500 tend to accept advanced and emerging technologies, whereas the Inc. 500 prefer to use mature and easy-to-use technologies.

As Internet and Web technologies have advanced from delivering static informational pages to enabling dynamic, interactive Web applications and services such as B2B/B2C/C2C e-commerce, CRM, and ERP, doing business on the Internet becomes a competitive advantage. More and more large U.S. corporations not only tie their basic information technology (IT) infrastructure into the Internet, but also move their core business functions to a Web-centric model (CIO Insight, 2003; Downes, 2000; Lake, 2000; Olsen, 2003; Perry, 2000; Ricadela, 2004). According to CIO Insight's recent report, 42% of the companies reported significant revenue increases due to e-business, 59% of the companies reported significant cost savings by having implemented e-business strategies, and 60% of the companies closely track the value of their e-business efforts (CIO Insight, 2003).

Having witnessed the benefits of the Internet, small American companies are also investing more in IT to achieve a competitive advantage (Taft, 2002; U.S. Small Business Administration, 2000, 2003). Now almost every U.S. company, large or small, has a Web site for communicating and sharing information, promoting products and services, or doing business online (Olsen, 2003; Perry, 2000; Taft, 2003). While the static informational Web sites are simply created with html, building dynamic, interactive Web applications and services required advanced Web technologies and languages (Imparato, 2002; McCarthy, 2002; Taft, 2002). The literature review (e.g., Imparato, 2002; Knorr, 2003; McCarthy, 2002; Taft, 2002, 2003; World Wide Web Consortium, 2002; Web Developers Virtual Library, 2002) identified a long list of advanced Web technologies and languages such asp, aspx, asmx, cfml, cgi, css, dll, gsp, jhtml, jsp, php, shtml, wml, xhtml, xml, JavaScript, Java, VBScript, Visual Basic, Visual Basic.Net, Visual C++, and C#. Therefore, understanding how large and small U.S. companies use Internet/Web

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technologies and their similarities and differences in using those technologies appears to be important for IT educators in order to keep their curricula current and appropriate to meet varied market needs.

PROBLEM AND PURPOSE

The research problem addressed in this study was to compare the Internet technologies used on *Fortune 500* and *Inc. 500* corporate Web sites, which represent the large and small U.S. companies in a wide range of industries. We raised three research questions for the comparative analysis:

R1 What technologies do *Fortune 500* and *Inc. 500* companies use most or least on their respective Web sites?
R2 What are their objectives of using the technologies?
R3 How efficiently and effectively do the companies use the technologies on their Web sites?

To identify any significant differences between the two groups, we used the independent t-test technique.

The purpose of the study was threefold. First, the findings from the comparative analysis would be valuable for IT educators to keep their curricula current. Second, the findings would enable IT professionals to know how similarly and differently *Fortune 500* and *Inc. 500* companies use Internet/Web technologies. Third, the findings would enable the Internet/Web technology vendors to compare the market acceptance levels, usage patterns, and effects of their technologies among *Fortune 500* and *Inc. 500* companies. Thusly, vendors will be able to make appropriate decisions, such as how to adjust marketing strategies and whether to improve or to discontinue those less effective, less efficient, or least used technologies.

METHODOLOGY

This study is a comparative content analysis of the Internet technologies used on *Fortune 500* and *Inc. 500* corporate Web sites. Content analysis is one of the major methodologies employed in social science studies (Frey, Botan, Friedman, & Kreps, 1991). This research method is ideal for making inferences by systematically and objectively recording the technology contents on the Web and then identifying the causal relationships between the Internet/Web technologies and their user acceptance and usage patterns.

Two sample groups were used for the comparative analysis. To guarantee that each sample group would be within 5% variation from its true population value, we used Jaeger's (1984) formula for determining sample size, which resulted in 217 out of each of the *500* companies for random sampling. Based on the related literature, we developed an instrument including four major categories: (a) usage of technologies, (b) usage objectives, (c) usage efficiency, and (d) usage effectiveness.

To measure *usage efficiency*, the page loading time per second (a critical Web design factor) was rated. As research indicates, Web visitors decide whether to continue surfing on a Web site, or not, just within the first few seconds of clicking on its hyperlinks. A Web page that comes up within one second is considered very efficient in loading speed, whereas a page requiring eight seconds or more for loading is considered not at all efficient, even for the dial-up modem speeds of 28.8 KB to 56 KB per second (Awad, 2004; Zhao, 2003; Zimmerman, 2000). Since our study was conducted in a school computer lab with a LAN connection, the page loading time was rated with a Likert scale: (4) very efficient=less than one second, (3) efficient=one to two seconds, (2) less efficient=three to four seconds, and (1) not efficient=more than four seconds.

Usage effectiveness was measured with four design factors: (a) number of screens per page, (b) graphical user interface (GUI) and usability, (c) number of interactive pages of fill-in forms, and (d) run-time error. As research shows, one principle of Web page design is to provide Web visitors with a complete picture of what the page is all about on practically the first screen, or at least by the second, without requiring much scrolling (Udo & Marquis, 2002; Zhao, 2003). Balanced

design of a GUI and usability creates consistency and aesthetic appeal to Web visitors, thereby making communication and navigation effective (Udo & Marquis, 2002; Zhao, 2003). The number of interactive pages of fill-in forms also makes a big difference. Schaffer's (2001) study identified that 88% of shoppers abandoned their online shopping carts before reaching the checkout stage; quite possibly, they became too frustrated to go through many steps, couldn't get immediate online help, or felt they were providing too much information about themselves. Run-time error messages on client browsers not only are annoying to visitors but also indicate the Web developers' poor or no testing before publishing the pages (Zhao, 2003).

To measure usage effectiveness, this study used the following Likert scale: (4) very effective, (3) effective, (2) less effective, and (1) not effective, with their respective operational definitions:

- Very effective means that a Web site has (a) most pages of one to two screens long, (b) well-balanced design of a GUI and usability, (c) no more than three interactive pages of fill-in forms for online shopping application, and (d) no run-time error.
- Effective refers to a Web site that has (a) most pages of two to three screens long, (b) balanced design of a GUI and usability, (c) four interactive pages of fill-in forms for online shopping application, and (d) no run-time error.
- Less effective means that a Web site has (a) most pages of three screens long, (b) less balanced design of a GUI and usability, (c) four interactive pages of fill-in forms for online shopping application, and (d) one run-time error.
- Not effective refers to a Web site that has (a) most pages longer than three screens, (b) less balanced design of a GUI and usability, (c) more than four interactive pages of fill-in forms for online shopping application, and (d) more than one run-time error.

Two research assistants majoring in information systems were trained to develop: (a) a common understanding of Internet/Web technologies and Web file extensions and (b) the ability to read the source code and to record data with the instrument. Since this content analysis was conducted at the front end of the Web sites and applications by reading and recording the source code and Web file types, the data collection would not include the back-end server-side details. The data collection of the *Fortune 500* corporate Web sites started in September and completed in December 2002, while that of the *Inc. 500* sites was done in the same time frame during 2003 in order to identify the possible time gap between the *Fortune 500* and *Inc. 500* companies in accepting new technologies. Each week the research assistants turned in 20 completed questionnaires, and we subsequently performed a validation crosscheck by revisiting five randomly selected Web sites from the 20 completed questionnaires within the same week.

Of the 217 randomly selected *Fortune 500* companies, only one company had no corporate Web site at the time of data collection. Therefore, data were collected from 216 corporate Web sites, which comprised 99.5% of the sample and ensured valid representation of the population at a 95% confidence level. By contrast, of the 217 randomly selected *Inc. 500* companies, 11 companies had no corporate Web sites or Web sites under construction at the time of data collection. Thus, data were collected from 206 corporate Web sites, or 95% of the sample, and also assured valid representation of the population at a 95% confidence level.

The data collected from the two groups were analyzed for frequency counts, percentage distributions, and weighted averages. In analyzing the data, we used the midpoints of each scale range (the real outer limits) for determining the degree of efficiency and effectiveness: weighted mean responses of 3.5-4.0=very efficient or very effective, 2.5-3.4=efficient or effective, 1.5-2.4=less efficient or less effective, and 1.0-1.4=not efficient or not effective. To

determine any significant differences between the two groups, we used the independent t-test. We also employed correlation analysis to identify any significant association strength of the technology usage efficiency and effectiveness within each group and between the two groups. The rationale for the correlation analysis is that a strong correlation between usage efficiency and effectiveness indicates a well -rounded and -balanced Web site with efficient and effective uses of technologies. In contrast, a weak correlation reveals poor design in either the efficiency or effectiveness aspects. For instance, a Web page might be very efficient in loading time but not effective in attracting visitors and communicating messages because of the poor design of layout, graphics, text, and navigation. Therefore, the correlation analysis findings would provide additional insights and richness.

Table 1 shows a comparison of the demographic profiles of the two sample groups, which represent seven major industry groups covering a wide range of businesses.

Table 1: Demographic Profiles of Participating *Fortune 500* and *Inc. 500* Companies

	Fortune 500 (n=216)		*Inc. 500* (n=206)	
Types of Company Business	**Frequency**	**Percentage**	**Frequency**	**Percentage**
Manufacturing/Processing	59	27%	34	17%
Banking/Finance/Insurance	33	15%	19	9%
Retail/Wholesale	30	14%	18	9%
Transportation/Utilities	28	13%	11	5%
Information/Communications	25	12%	93	45%
Healthcare/Hospitality/Staffing/Consulting	22	10%	26	13%
Construction/Engineering/Mining/Oil/Gas	19	9%	5	2%
Total	**216**	**100%**	**206**	**100%**

FINDINGS

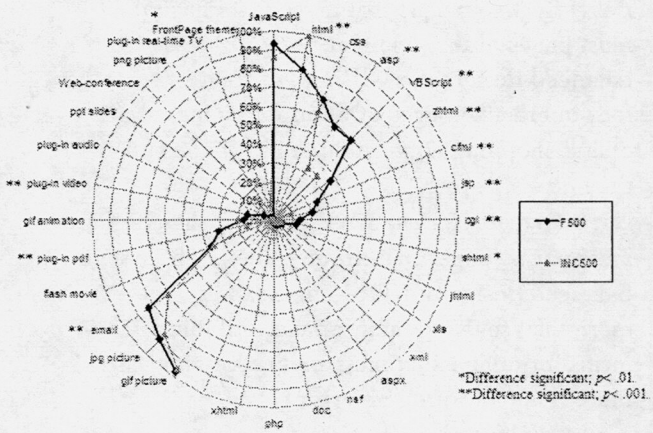
The findings of the study are reported in the following four sections: (a) Comparison of Internet Technology Usage, (b) Comparison of Technology Usage Objectives, (c) Comparison of Technology Usage Efficiency, and (d) Comparison of Technology Usage Effectiveness. We report significant differences between the two groups in their related sections.

COMPARISON OF INTERNET TECHNOLOGY USAGE

Figure 1 shows the comparison of technologies used on *Fortune 500* and *Inc. 500* corporate Web sites, respectively. The content analysis identified 18 programming technologies and languages and 12 graphics and multimedia used on the 216 *Fortune 500* corporate Web sites, whereas only 13 programming technologies and languages and 10 graphics and multimedia were identified on the 206 *Inc. 500* corporate Web sites.

Both the *Fortune 500* and *Inc. 500* corporate Web sites used the following five programming technologies and languages more frequently:

Figure 1: Comparison of Technologies Used on *Fortune 500* and *Inc. 500* Web Sites



JavaScript (93% vs. 86%), html (81% vs. 99%), css (69% vs. 63%), asp (59% vs. 33%), and VBScript (59% vs. 33%), with the remaining ones as less-frequently used or not-at-all used by respective groups, which included the emerging xml (3% vs. 0.5%), aspx (3% vs. 2%), and xhtml (1% vs. 0%). Significant differences existed between the two groups in using the following eight technologies: html (81% vs. 99%), asp (59% vs. 33%), VBScript (59% vs. 33%), zhtml (37% vs. 0%), cfml (25% vs. 10%), jsp (21% vs. 2%), cgi (14% vs. 4%), and shtml (12% vs. 4%).

Regarding the usage of graphics and multimedia, most of the *Fortune 500* and *Inc. 500* corporate Web sites used gif pictures (97% vs. 95%), jpg pictures (89% vs. 85%), and email (83% vs. 70%). A little more than one third of the *Fortune 500* and *Inc. 500* sites used flash movie (37% vs. 36%), followed by plug-in pdf (31% vs. 15%) and gif animation (17% vs. 20%). While the *Fortune 500* sites did not use FrontPage theme, 9% of the *Inc. 500* sites used it. Other least used ones by both groups included plugin real-time TV (0.5% vs. 0%), png picture (1% vs. 0%), and Web-conference (1% vs. 0%). Significant differences between the two groups were identified in using email (83% vs. 70%), plug-in pdf (31% vs. 15%), plug-in video (15% vs. 2%), and FrontPage theme (0% vs. 9%).

The comparative analysis further identified that nearly half of the *Fortune 500* (46%) sites and one third of the *Inc. 500* (34%) sites used a combination of five to six Web programming technologies. In contrast, approximately one third of the *Fortune 500* (38%) sites and about half of the *Inc. 500* (53%) sites used a combination of three to four. Only 5% of the *Fortune 500* sites and 13% *Inc.* of the *500* sites used one to two Web programming technologies.

For Web graphics and multimedia, more than half of the *Fortune 500* (63%) and *Inc. 500* (52%) sites used three to four types of graphics and multimedia, followed by 28% of the *Fortune 500* sites and 47% of the *Inc. 500* sites, which used one to two types. By contrast, only 9% of the *Fortune 500* sites and 1.5% of the *Inc. 500* sites used five or more types of Web graphics and multimedia.

COMPARISON OF TECHNOLOGY USAGE OBJECTIVES

Table 2 illustrates a comparative analysis of the technologies used by the *Fortune 500* and *Inc. 500* corporate Web sites for home pages, public and investor relations, information search, business to consumers (B2C), business to business (B2B), career, and contact-us sites. As the percentages indicate, both the *Fortune 500* and *Inc. 500* groups used the following five programming technologies and three graphics and multimedia more frequently than others for the above seven specific objectives: JavaScript, css, html, asp, VBScript, gif picture, email, and jpg picture. In addition, flash movie was used more frequently by both groups for home pages, public and investor relations, and B2B sites than for other sites, whereas plug-in pdf was used by the two groups more frequently only for public and investor relations.

Significant differences existed between the two groups in using certain programming technologies, graphics, and multimedia for some specific objectives. As shown in Table 2, the *Inc. 500* group used html significantly more often than the *Fortune 500* group did for home pages, public and investor relations, B2B, career, and contact-us sites. By contrast, the *Fortune 500* group used

Figure 2: Comparison of Technology Usage Efficiency Between *Fortune 500* and *Inc. 500* Web Sites

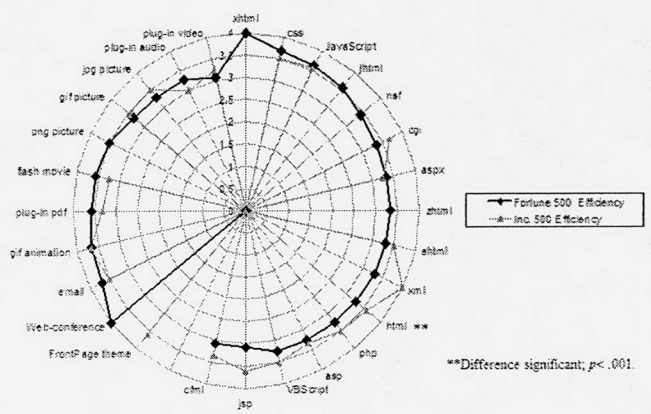


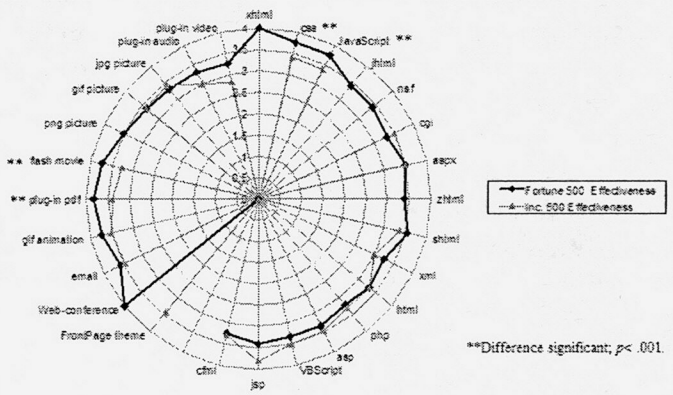
Table 2: Comparison of Technologies Used by *Fortune 500* and *Inc. 500* for Specific Corporate Web Site Objectives

Tech Used for	Home P		PR/IR		Info-Srch		B2C		B2B		Career		Contact	
Programming	Fortune	Inc.	Fortune	Inc.	Fortune	Inc.	Fortune	Inc.	Fortune	Inc.	Fortune	Inc.	Fortune	Inc.
javaScript	87%	75% *	87%	72%**	70%	30%**	58%	26%**	56%	81%**	42%	38%	37%	38%
css	59%	53%	63%	53%	50%	21%**	41%	17%**	41%	62%**	36%	29%	32%	31%
html	57%	90%**	67%	86%**	41%	31%	35%	29%	40%	88%**	29%	42% *	21%	47%**
asp	21%	24%	40%	26 % *	34%	15%**	29%	12%**	27%	32%	21%	12%	15%	12%
VBSpript	21%	25%	40%	25% *	34%	14%**	29%	12%**	27%	33%	21%	12%	15%	11%
jsp	8%	1%	9%	1%	10%	1%	11%	1%	7%	3%	4%	1%	4%	0%
cfml	2%	4%	20%	7%	6%	4%	5%	1%	5%	6%	4%	6%	2%	3%
zhtml	0%	0%	35%	0%**	2%	0%	0%	0%	1%	0%	0%	0%	2%	0%
shtml	4%	0%	8%	0%	4%	0%	5%	0%	6%	0%	1%	0%	1%	0%
jhtml	2%	0%	4%	0%	3%	0%	2%	0%	2%	0%	1%	0%	1%	0%
cgi	1%	2%	8%	2%	7%	2%	6%	2%	6%	3%	1%	0%	1%	1%
aspx	1%	1%	2%	1%	1%	0%	2%	0%	2%	3%	1%	1%	0%	1%
php	1%	2%	1%	3%	1%	3%	0%	2%	1%	3%	1%	1%	0%	1%
xhtml	1%	0%	1%	0%	1%	0%	1%	0%	1%	0%	0%	0%	0%	0%
xml	0%	1%	2%	0%	1%	0%	1%	1%	1%	0%	0%	0%	0%	0%
Graphics/Multimedia														
gif picture	89%	88%	93%	81% *	71%	32%**	62%	32%**	60%	86%**	46%	39%	38%	39%
email	83%	8%**	83%	34%**	6%	8%	62%	3%**	60%	15%**	83%	17%**	83%	48%**
jpg picture	68%	70%	77%	69%	46%	27%**	56%	24%**	51%	70%**	34%	25%	16%	19%
flash movie	21%	31%	13%	16%	8%	5%	13%	3%	11%	12%	6%	6%	2%	5%
plug-in pdf	1%	3%	29%	12%**	7%	2%	1%	2%	1%	6%	0%	0%	0%	1%
gif animation	8%	19%	6%	10%	4%	5%	4%	9%	5%	6%	2%	1%	0%	0%
plug-in video	1%	2%	15%	1% *	0%	0%	0%	1%	0%	0%	1%	0%	0%	0%
FrontP. Theme	0%	7%	0%	6%	0%	2%	0%	3%	0%	6%	0%	2%	0%	4%
plug-in audio	0%	0%	10%	1%	0%	0%	0%	0%	0%	0%	1%	0%	0%	0%

* Difference significant; $p < .01$ ** Difference significant; $p < .001$

JavaScript, css, asp, VBScript, gif picture, email, jpg picture, plug-in pdf significantly more often than the counterpart did for many specific objectives.

Figure 3: Comparison of Technology Usage Effectiveness Between *Fortune 500* and *Inc. 500* Web Sites



COMPARISON OF TECHNOLOGY USAGE EFFICIENCY

As Figure 2 shows, 16 programming technologies and 10 graphics and multimedia were rated as being used very efficiently or efficiently on the *Fortune 500* corporate Web sites, whereas on the *Inc. 500* corporate Web sites, 12 programming technologies and 9 graphics and multimedia received similar ratings. Microsoft doc, xls, and ppt files were not listed because they only work well with the Internet Explorer browser but not with Netscape and other browsers. A significant difference existed only in using html, where the *Fortune 500* group had an efficient score of 3.26 while the *Inc. 500* group achieved a very-efficient score of 3.57. In addition, although the usage efficiency of xml indicated a wide gap between the two groups (3.29 vs. 4.0), no statistical significance existed, because only one *Inc. 500* corporate site used xml vs. seven *Fortune 500* companies

COMPARISON OF TECHNOLOGY USAGE EFFECTIVENESS

Figure 3 compares how effectively the *Fortune 500* and *Inc. 500* corporate Web sites used Internet/Web technologies. Similar to their usage efficiency findings, the *Fortune 500* sites used 16 programming technologies and 10 graphics and multimedia either very effectively or effectively, and the *Inc. 500* sites did the same with their 12 programming technologies and 9 graphics and multimedia. Significant differences existed between the two groups only in using the following four technologies: css (3.74 vs. 3.4), JavaScript (3.74 vs. 3.37), plug-in pdf (3.84 vs. 3.41), and flash movie (3.73 vs. 3.26). As the weighted means indicate, the *Fortune 500* group used the four technologies far more effectively than the *Inc. 500* group.

Table 3 presents the correlation analysis of the technology usage efficiency and effectiveness within each group and between the two groups. Significant correlation coefficients existed only between the usage efficiency and effectiveness within each group. While the *Fortune 500* group achieved a significant coefficient of 0.955154517 between its technology usage efficiency and effectiveness, the *Inc. 500* group obtained a significant coefficient of 0.947702501 between the same variables. However, no significant coefficients were identified between the two groups regarding any pair of variables.

Table 3: Correlation Analysis of Technology Usage Efficiency and Effectiveness

Correlation Coefficient	*Fortune 500* Efficiency	*Fortune 500* Effectiveness	*Inc. 500* Efficiency	*Inc. 500* Effectiveness
Fortune 500 Efficiency	1			
Fortune 500 Effectiveness	0.955154517	1		
Inc. 500 Efficiency	0.249005621	0.125312637	1	
Inc. 500 Effectiveness	0.239282526	0.152462478	0.947702501	1

SUMMARY AND DISCUSSION

The comparative content analysis identified that both the *Fortune 500* and *Inc. 500* corporate Web sites used the following eight technologies more frequently: html, JavaScript, css, asp, VBScript, gif pictures, jpg pictures, and email. These eight technologies were frequently used for specific objectives, such as home pages, public and investor relations, information search, B2C, B2B, career, and contact-us sites. Such frequent usages of these eight Internet and Web technologies support the related literature in that these technologies are popular and essential for developing Web sites and applications (Web Developers Virtual Library, 2002; World Wide Web Consortium, 2002).

In contrast, the two new leading-edge Web technologies, xml and aspx, were identified on just a few sites of the *Fortune 500* and *Inc. 500* companies. This low deployment rate seems to indicate that these two technologies are still at the introductory stage to the market. It appears to take a longer time and more money for companies to invest in these new and complex technologies and also a longer time for IT professionals to master them and deploy xml- and aspx-based Web applications and services.

Second, the public and investor relations' sites of the *Fortune 500* and *Inc. 500* companies stood out in using additional technologies such as flash movie, gif animation, plug-in pdf, plug-in video, and plug-in audio. However, these additional technologies were seldom or not at all used on other types of sites. This finding suggests that to attract the public and investors and to keep them revisiting the sites, companies used a larger variety of programming technologies, graphics and multimedia for communication enhancement than they did for other types of sites. Obviously, flash movie, plug-in pdf, plug-in video, and plug-in audio are appropriate choices for the public and investor relations' sites.

In addition, the 216 *Fortune 500* corporate Web sites and the 206 *Inc. 500* corporate Web sites demonstrated efficient and effective use of their selected Web programming technologies, graphics, and multimedia. This finding suggests that the *Fortune 500* and *Inc. 500* corporate Web sites could serve as models for teaching and learning how to develop effective and efficient corporate Web sites and e-business applications and services for large and small companies, respectively.

Furthermore, significant differences existed between the *Fortune 500* and *Inc. 500* in frequencies of using html, asp, VBScript, zhtml, cfml, jsp, cgi, shtml, email, plug-in pdf, plug-in video, and FrontPage theme. Except for html and FrontPage theme, the *Inc. 500* group used the other 10 relatively more advanced technologies significantly less frequently than the *Fortune 500* group did, even though the study gave the *Inc. 500* group one year to catch up on the new technology acceptance curve. Such differences imply that the *Fortune 500* sites tend to accept advanced and emerging technologies, whereas the *Inc. 500* prefer to use mature and easy-to-use technologies.

Significant differences were also identified between the *Fortune 500* and *Inc. 500* in technology usage efficiency and effectiveness. While the *Fortune 500* group used css, JavaScript, plug-in pdf, and flash movie significantly more effectively than the *Inc. 500* group, the *Inc. 500* group used html far more efficiently than its counterpart. These findings suggest that high usage frequency might lead to high usage effectiveness or efficiency. The findings could serve as references for IT professionals to recommend appropriate technologies when designing Web sites and e-business applications and services for large and small companies. The findings could also assist Internet/Web technology vendors in improving strategies to better serve their large and small corporate customers, respectively.

Finally, the results of the correlation analysis further support the foregoing findings. While no significant between-group correlations existed in either usage efficiency or effectiveness, both the *Fortune 500* and the *Inc. 500* groups achieved significant within-group correlation between usage efficiency and effectiveness, respectively. These findings emphasize that the *Fortune 500* group and the *Inc. 500* group used their own combinations of varied technologies to develop well-rounded and -balanced Web sites, as shown

in the strongly correlated usage efficiency and effectiveness, for meeting their respective objectives and budgets. Therefore, the *Fortune 500* corporate Web sites could serve as models for teaching and learning how to develop effective and efficient corporate Web sites and e-business applications and services for large companies, whereas the *Inc. 500* corporate Web sites could be models for small companies.

CONCLUSIONS AND RECOMMENDATIONS

The following eight technologies appear to be most popular for developing corporate Web sites and applications for both large and small companies: html, JavaScript, css, asp, VBScript, gif pictures, jpg pictures, and email. IT educators should consider including these eight essential technologies in their programs when updating their curricula and IT professionals should consider these essential technologies for building effective and efficient corporate Web sites.

To enhance public and investor relations through better communication on the Web, companies could use such technologies as flash movie, plug-in pdf, plug-in video, and plug-in audio for the public and investor relations' sites. Additionally, the plug-in pdf and flash movie would be more cost effective than plug-in video and audio. IT educators need to be aware that the *Fortune 500* corporate Web sites use flash movie and plug-in pdf more effectively than the *Inc. 500* Web sites.

The *Fortune 500* and *Inc. 500* corporate Web sites and their technology usage similarities and differences could serve as teaching models. With these models, IT educators could teach students how to select appropriate Internet and Web technologies and how to develop efficient and effective corporate Web sites and e-business applications, which meet the needs and budgets of large and small companies, respectively.

To increase the speed of new technology acceptance and deployment, the Internet/Web technology vendors, such as those selling software tools for using aspx, cfml, jhtml, jsp, php, shtml, xhtml, and xml, need to improve their marketing and promotion strategies and provide IT professionals, educators, as well as students, with better training opportunities for using such technologies.

Since XML and ASP.NET are two leading technologies and are still in the introductory stage, learning and using these leading-edge technologies can help IT professionals and students not only gain a competitive advantage on the job market but also develop more advanced enterprise Web applications and services. Therefore, school administrators should provide adequate funds and encourage IT educators to adopt and teach such leading-edge technologies.

RECOMMENDATIONS FOR FURTHER RESEARCH

As this study was limited to the technology content analysis at the front end of corporate Web sites and applications, the back-end server-side details were not included. Future research should be undertaken among these companies to determine: (a) the relationships between their Web development tools and their Web sites and applications, (b) the developers' experience and satisfaction of working with their tools for their sites and applications, and (c) the return-on-investment (ROI) of their Web sites and applications.

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